River Almanac

An Information Sharing Bulletin of the
Long Term Resource Monitoring Program

U.S. Department of the Interior
U.S. Geological Survey

Abstracts of selected LTRMP study efforts

The following abstracts provide overview information on LTRMP study efforts. Additional information may be obtained by contacting the Environmental Management Technical Center at 608/783-7550, extension 65.

Burkhardt, R. 1996. Relationships among flow, water depth, sediment texture, and fingernail clam densities. Paper presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

The objectives of this study were (1) to explore the interactions among the physical conditions of sediment, water depth, flow, and the spatial distribution and abundance of fingernail clams (*Muscullium transversum*) and (2) to develop and verify a model that predicts fingernail clam densities by combining a hydraulic model (FastTabs) with bathymetry coverages for Lake Onalaska. During 1995, six regions were defined in Lake Onalaska, Pool 7, Upper Mississippi River, based on water flow and depth. Flows were calculated using the hydraulic model FastTabs (COE, St. Paul District) implemented for Lake Onalaskà. Depths were calculated based on bathymetric data collected by the EMTC. Forty eight sites were randomly selected within these regions and sampled using a standard Ponar (area=0.052 m^2) during July 17-19 and resampled August 15-17, 1995. Sediment texture was determined from the top 5 cm of

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Signs of change at the Environmental Management Technical Center

A new entrance sign outwardly reflects the merger of the EMTC into the U.S. Geological Survey. The Center had been part of the National Biological Service until October 1996. USGS Headquarters and Regional Office representatives were on hand to inspect the recently installed sign. From left to right, Robert Delaney, *EMTC Center Director,* Marion Fisher, *Office of Outreach,* Katherine Lins, *Eastern Regional Director,* Tim West, *Congressional Liaison Office.* *(EMTC Photo by Norman Hildrum)*

St. Louis District given River Award

by Joe Wlosinski

The St. Louis District, U.S. Army Corps of Engineers, won the first annual River Restoration Award from American Rivers, a national river conservation group based in Washington, DC. The award was presented to the District for their part in a 1995 water-level experiment performed in cooperation with the Pool 25 Natural Resources Management Committee. The committee is an interagency group working to improve habitat in the Upper Mississippi River floodplain.

The District held water levels about two feet lower than the project pool elevation in Pools 24, 25, and 26 for at least 30 days during the summer to allow plant germination and growth. The experiment was considered a success not only because

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sediment obtained from 5-cm diameter core samples. Fingernail clams were enumerated within juvenile (≤2 mm) and adult (>3 mm) size classes. Significant differences in adult ($P = 0.37$) or juvenile ($P = 0.46$) densities were not observed among the regions during July. However, significant differences ($P = 0.01$) were found during August. Adult and juvenile fingernail clam densities in Regions 4 and 5 increased significantly ($P = 0.01$) from July to August. Results from July suggest that fingernail clams in Lake Onalaska had no significant regional or sediment preference ($P = 0.49$). However, results from August suggest that regions with silt and sand/silt/clay were preferred over areas of sand. Favorable locations for fingernail clams were predicted with some accuracy (61%) using the FastTabs hydraulic model and bathymetry coverage. Detailed measurement of sediment characteristics over wide areas is too time consuming for widespread application. Further, sediment measurements alone do not account for additional effects of flow (water exchange). Thus, the FastTabs model may provide a tool for river managers to predict preferred areas for fingernail clams using more easily obtained measurements.

Marecek, S. R., and J. H. Wlosinski. 1996. Fish movement through dams on the Upper Mississippi River. Paper presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

We analyzed the results of 8 mark-recapture and telemetry studies conducted on the Upper Mississippi River as part of an investigation on fish passage opportunities. Fish were marked in Pools 4 through 18 and 26. Studies included information for 15 species of fish: black crappie, white crappie, bluegill, northern pike, common carp, channel catfish, freshwater drum, flathead catfish, largemouth bass, paddlefish, sauger, shovelnose sturgeon, smallmouth bass, walleye, and white bass.

The total number of fish marked in 59 of the studies was 62,618. Totals were not available for the remaining 30 studies. Less than 10% of the marked fish were recaptured. No black crappie, white crappie, bluegill, northern pike, or common carp were found to move across a single lock and dam, either in an up or down direction. Of the total number of fish recaptured in all studies, 4,594 (79.7%) were in the pool where the fish were initially marked, 712 (12.4%) moved upriver and 458 (7.9%) moved down river.

We also investigated the head differential between headwaters and tailwaters for each day a fish was at large. Unfortunately, most fish were at large for fairly long periods, so we could not pinpoint the head differential when the fish actually crossed a dam. The minimum head differential during the period when fish were at large was used to conservatively estimate fish passage opportunities. Of the fish moving upriver through dams, 88.0% crossed with a head differential less than 2.0 feet. Of the fish moving downriver through dams, 72.0% crossed with a head differential less than 2.0 feet. Only 3.9% of the fish that moved upriver did so when the head differential was at least 4.0 feet and 19.4% of the fish that moved downriver did so at that head differential.

Of the walleyes, which made up 53% of the total number of fish that moved, 78% moved upriver through at least one dam. Of the walleyes that moved upriver, the majority crossed one to five dams. Ninety-one percent of the sauger, which made up 15% of the observations, also moved upriver through at least one dam. In contrast, 94% of the channel catfish, which made up 20% of the observations,

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River Almanac

River Almanac is an authorized publication of the U.S. Department of the Interior, published periodically by the Environmental Management Technical Center to provide an ongoing exchange of information between the EMTC and other Long Term Resource Monitoring Program participants and the general public.

Robert L. Delaney
Center Director

Norman W. Hildrum
Almanac Coordinator

Mark Wenger
Almanac Editor

The Environmental Management Technical Center is a U.S. Geological Survey facility located in Onalaska, Wisconsin, USA. The Technical Center manages the Long Term Resource Monitoring Program (LTRMP), which is the largest river-related inventory and monitoring, research, spatial analysis, and information sharing program in the United States.

The Long Term Resource Monitoring Program for the Upper Mississippi River System was authorized under the Water Resources Development Act of 1986 as an element of the Environmental Management Program. The mission of the LTRMP is to provide river managers with information for maintaining the Upper Mississippi River System as a sustainable large river ecosystem given its multiple-use character.

The LTRMP is a cooperative effort of the U.S. Geological Survey, the U.S. Army Corps of Engineers, and the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin.

Questions or comments may be directed to the EMTC, River Almanac Staff, 575 Lester Avenue, Onalaska, WI 54650-8552, Telephone: 608/783-7550, Fax: 608/783-8058.

River Almanac is also available on the World Wide Web:

http://www.emtc.nbs.gov

Opinions expressed in this bulletin do not necessarily reflect the position of the U.S. Department of the Interior or any LTRMP participant.

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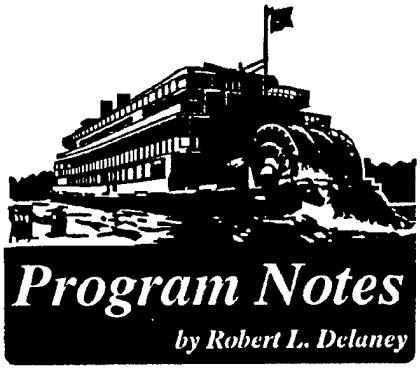

With the rollout of the new USGS visual identity, I was struck by how well the new motto—*science for a changing world*—fit our center and our mission statement. What better way to describe an organization that is providing scientific insights into the rapidly changing Upper Mississippi River system. The emphasis on "change" is also quite appropriate given our recent efforts at revising the Center's mission statement. This effort was in response to recent Center and Program reviews. The proposed mission statement follows:

> *The Center works with partners to provide the scientific understanding, information, and technologies needed to support the sound management of large river systems with emphasis on the Upper Mississippi River.*

We believe our revised mission statement more accurately reflects the principles that guide Center activities. In particular, we strongly believe that cooperation with Federal, state, and local partners will be even more important in the upcoming years. This partnering will enable us to provide the scientific foundations on which sound river management is built. While our focus is on the Upper Mississippi River (UMR), we realize that the scientific knowledge gained on the UMR may also apply to other large river systems including other parts of the Mississippi River.

We encourage public input. Comments concerning this proposed mission statement may be directed to the Center Director, Environmental Management Technical Center, U.S. Geological Survey, 575 Lester Ave., Onalaska, WI 54650. Comments may also be mailed to Robert_Delaney@usgs.gov. ❖

Upper Midwest atmospheric mercury deposition rates declining, while global emissions remain high, say Minnesota researchers

Atmospheric inputs of mercury into Minnesota lakes have declined from 1960's and 1970's peak levels due to reduced regional emissions, but worldwide mercury emissions remain high. These findings were reported in a study by Science Museum of Minnesota and Minnesota Pollution Control Agency (MPCA) researchers and published in the April issue of Environmental Science and Technology. The researchers measured historical rates of mercury accumulation in sediment cores from the bottom of 15 lakes. The lakes were chosen from three regions where different mercury emission sources should dominate, including four Minneapolis lakes, eight rural lakes in northeastern and west-central Minnesota, and three remote wilderness lakes in southeastern Alaska. Mercury accumulation trends in these vastly different areas were compared in order to separate deposition changes in the upper Midwest from those occurring globally.

"Until we analyzed our data decade by decade, we thought mercury deposition was increasing everywhere around the world, so the declining trend in Minnesota was a pleasant surprise," said Daniel Engstrom, senior scientist at the museum's St. Croix Watershed Research Station and the study's principal author. "The difference between the regional trend in Minnesota and the global trend in Alaska also is surprising, and the contrast allows us to make the first estimate of how much of our mercury problem comes from far away and how much originates closer to home. The geographic pattern demonstrates that mercury pollution cannot be viewed as a purely global problem."

The sediment cores from the Minnesota lakes showed that atmospheric mercury deposition rose above natural (background) levels around 1850, increased dramatically between 1920 and 1960, and then declined. Present rates of mercury accumulation are three to five times higher than those of pre-industrial times, but are about 25 percent lower than peak rates seen in the 1960s and 1970s. The Alaskan lakes, in contrast, showed a steady increase in mercury accumulation from pre-industrial times to the present. Modern mercury accumulation rates are less than those in Minnesota, but show no recent declines. These pristine lakes, located in Glacier Bay National Park, are far from any regional mercury pollution sources and thus receive all of their mercury by long-distance atmospheric transport from emission sources throughout the northern hemisphere. The steady rise in mercury accumulation in the Alaskan lakes shows that global mercury emissions have not abated and that the declines in the Minnesota lakes must be of local or regional origin.

The researchers evaluated historical records of industrial mercury use and emissions in the U.S. and concluded that decreased mercury deposition to Midwestern lakes likely resulted from a dramatic reduction in industrial use of mercury, use of pollution-control technologies for sulfur and particulates that incidentally capture mercury, and a shift in the use of coal from heating and railroads to electrical production. By comparing the change in mercury deposition rates between Minnesota and Alaska, the scientists calculated that roughly 30 percent of the mercury entering Minnesota lakes today is from worldwide sources, 40 percent is from Minnesota and regional sources, and the remaining 30 percent occurs naturally.

"The good news is that a variety of pollution control efforts over the past few decades have led to reduced mercury deposition in the upper Midwest," said Edward Swain, MPCA research scientist and the study's co-author. "The bad news is that while our regional component has been going down, global pollution has been increasing. We need to work with other countries to reduce global mercury pollution so everyone can benefit."

"These results underline the importance of our new comprehensive mercury reduction initiative," said Peder Larson, MPCA commissioner. "We are working with other mercury-affected states in the area to develop a cost-effective strategy to reduce mercury emissions that we hope will be adopted by the U.S. as well as other countries."❖

Contacts: *Mary Stanik, Science Museum of Minnesota, 612/221-9423; or Deborah Dolan, Minnesota Pollution Control Agency, 612/282-6410*

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moved downriver through at least one dam. Of the channel catfish that moved downriver, the majority crossed four to nine dams.

Arndt, L., D. Bergstedt, and C. Lowenberg. 1996. Distribution of geographic information system data through the Internet. Poster presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

The Environmental Management Technical Center (EMTC) provides free access to a variety of geographic information system (GIS) data through its World Wide Web (web) Home Page (*http://www.emtc.nbs.gov*) and anonymous FTP site (*ftp.emtc.nbs.gov*). GIS datasets collected by the Long Term Resource Monitoring Program (LTRMP), the Upper Midwest GAP Analysis Program, and the Inland Waterways Mapping Project are accessible through the web site's Data Clearinghouse. The Data Clearinghouse uses interactive text pages and interactive graphics to locate and distribute copies of available GIS coverages, scanned images of the LTRMP's 1994 color-infrared aerial photography, spatial data applications, and metadata. The Web site also contains "links" to other GIS-related web sites.

Bartels, A. D., S. J. Gutreuter, and M. B. Sandheinrich. 1996. A test of an aspect of the flood-pulse concept of river ecology based on a model of fish growth. Paper presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

The Flood-Pulse Concept (FPC) of river ecology asserts that the annual flood cycle is the primary determinant of the productivity of floodplain rivers. The FPC is so general that it cannot be tested in total. Our objective was to examine one aspect of the FPC using monitoring data from the Upper Mississippi River. We hypothesized that at least some fishes should be able to acquire measurable increments of additional energy associated with floods. We examined somatic growth responses, which measure net energy gain, of bluegills (*Lepomis machrochirus*) and black crappies (*Pomoxis nigromaculatus*) captured in Navigation Pool 8. We developed a new statistical model of fish growth to test for size-specific growth differences among the 1993 flood year, two typical years, and a drought year. The model is a generalization of the difference or differential forms of the Gompertz function. The mean growth responses of bluegills were significantly different ($P < 0.01$) among years, and showed an ordered progression of slowest maximum growth during the drought to greatest maximum growth during the flood year. The mean growth responses of black crappies were only significantly different between the drought year and the pair of typical years ($P = 0.01$). These results are consistent with the FPC.

Gaugush, R. F., J. Hendrickson, D. Soballe, and A. Buesing. 1996. Island construction as a restoration technique in the Upper Mississippi River: From artificial islands to seed islands. Paper presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

The Upper Mississippi River Environmental Management Program (EMP) comprises two major programs: (1) the Long Term Resource Monitoring Program (LTRMP) and (2) the Habitat Rehabilitation and Enhancement Projects (HREPs). The HREPs involve site-specific projects constructed to address environmental concerns on the Upper Mississippi River System (UMRS). One type of HREP, island construction, has been carried out to address some of the environmental changes that have resulted from impounding the UMRS to support the 9-foot navigation channel.

A major change that has occurred with impoundment is the loss of islands in the lower (downstream) sections of the navigation pools. Initially after impoundment, these areas exhibited a braided network of sloughs, secondary channels, and numerous islands. Subsequently, these areas have become relatively featureless as islands have been eroded and deeper portions, other than the main channel, have filled in. Island loss in Pool 8 has been particularly severe. In 1939, two years after impoundment, the area of islands was 253 ha, and by 1989 the area had declined to 52 ha, a reduction of 79%. The lower portions of the navigation pools on the UMRS are now very wide, shallow, and exposed bodies of water. These conditions lead to highly turbid environments that support very little aquatic vegetation.

In 1989, three small islands were created in Lake Onalaska (Pool 7, UMRS) in order to (1) reduce wind fetch and potentially reduce turbidity resulting from wind-driven resuspension of sediment, (2) isolate areas from the direct effects of river currents, and (3) create additional shoreline and shallow, near-shore habitat that would enhance production of aquatic vegetation, fish, and waterfowl. These islands were created from dredged material, fully shaped, and armored with rock and rock groins. Research analyzed the changes in hydrology, sedimentation, sediment distribution, wind and wave relationships, water quality, aquatic vegetation, and invertebrates in response to the physical presence of these islands. Results indicated that these islands have had a profound impact on the physical environment which, in turn, results in significant changes in the biota around the islands. Island construction has created relatively quiet areas downstream of the islands, with associated changes in water quality, sediment type and distribution, and vegetation when compared with areas not impacted by the islands.

The success of the Lake Onalaska islands project lead to the development

of the seed islands concept and its initial application in lower Pool 8 near Stoddard, Wisconsin. Seed islands are simple rock structures with the river providing a large portion of the energy and material to build an island. With funding from the U.S. Fish and Wildlife Service and the State of Wisconsin and associated with other island protection work in lower Pool 8, the U.S. Army Corps of Engineers was able to construct two seed islands in November 1995. Rather than being fully constructed as the Lake Onalaska islands, these seed islands are relatively small (<70 m), linear rock structures laid out perpendicular to the advective flow. Research on these islands will document the rate of island growth, net sedimentation, and current velocity changes.

Burkhardt, R. 1996. Ichthyoplankton use of Lake Onalaska islands compared to off-channel areas within Pools 7 and 8 of the Mississippi River during 1994 and 1995. Poster presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

The objectives of this study were to (1) examine the relationships between physical and chemical conditions and spatial distribution, composition, and abundance of larval fish around the islands constructed in Lake Onalaska for the purpose of habitat restoration and enhancement and (2) compare them to off-channel areas. Daytime tandem larval fish tows (505 mm mesh) were conducted biweekly from May 3 to June 6 during 1994 and weekly during 1995 from March 21 until water temperatures reached 13 °C (May 9) then biweekly until June 16. Nine off-channel areas (Marsh Lake, Mud Lake, and Lake Onalaska Islands of Pool 7, and Round Lake, Target Lake, Markel Lake, Lawrence Lake, Byers Lake, and Shady Maple of Pool 8) of the Upper Mississippi River were selected. Sites were randomly selected within each off-channel area. Larval fish were identified to family. Catostomids, centrarchids, clupeids, cyprinids, esocids, gadids, hiodontids, percids, sciaenids, and serranids were represented in the catch. Differences in relative species composition (percentage of catch) of larval fish communities between Lake Onalaska Islands and other off-channel areas during each year were tested using general linear models. Because sample sizes were unequal, Tukey's studentized range test was used to determine specific statistical differences among areas. Cluster analysis was used to evaluate similarities in community composition among off-channel areas. Analysis of 1994 and 1995 larval fish data indicates catostomid catches in Lake Onalaska were significantly greater (P = 0.01) than the remaining off-channel areas in both years. Percid catches were significantly lower (P = 0.01) in Lake Onalaska Islands when compared to Byers Lake (1994) and Lawrence Lake (1995). Freshwater drum catches in Lake Onalaska Islands were significantly lower (P = 0.01) than in Markel Lake during 1994. Catostomid relative abundance (percentage of catch) was significantly higher (P = 0.01) in Lake Onalaska and centrarchid relative abundance was significantly greater (P = 0.01) in Target Lake, Lawrence Lake, Round Lake, and Mud Lake than in the other off-channel areas for both years. Similarities in community composition were found between Lake Onalaska Islands, Lawrence Lake, Round Lake, and Mud Lake during 1994 and Lake Onalaska Islands, Byers Lake, Markel Lake, and Marsh Lake during 1995. These results suggest that new habitats created by the construction of islands in Lake Onalaska are being used as nursery areas by most fish species commonly found in other off-channel areas.

Blodgett, K. D. 1996. Zebra mussel invasion of the Upper Mississippi River System: An overview. Paper presented at the Zebra Mussel Conferences for Inland Water Users: Control and Prevention for Municipalities and Industries, sponsored by the Illinois-Indiana Sea Grant and Ohio Sea Grant, June 12-13, 1996.

In river systems, zebra mussel veligers (larvae) produced at one location are transported downriver (possibly 2 weeks) before they are competent to settle; therefore, establishment and maintenance of dense populations of zebra mussels are likely dependent on reproducing populations upriver. Lake Michigan and the Mississippi River are connected by the Illinois River and its associated waterway in the Chicago metropolitan area; zebra mussel populations developing in southern Lake Michigan in 1990 provided a source for their invasion of the Mississippi River Basin. Veligers

Continued

LTRMP Successes Noted

A recent LTRMP management review survey concluded that nearly 94 percent of responding individuals believe that efforts to implement the congressionally mandated LTRMP/CIA had been successful. In addition, nearly 79 percent of respondents were currently using LTRMP products in their activities.

were likely transported down the waterway and the Illinois by current, although zebra mussels may be conveyed by commercial and recreational boats as well.

The first zebra mussel reported from the Illinois River proper was collected June 18, 1991, in Bath Chute, a side channel of the Illinois approximately 220 miles downriver from Lake Michigan. Although zebra mussels were reported from nearly a dozen sites along the Illinois by March 1992, densities were low with the highest density (16/m^2) reported at Hennepin, approximately 110 miles downriver from Lake Michigan.

Zebra mussel numbers increased significantly at monitoring sites on the Illinois in summer 1992 with a maximum mean density of 648/m^2. Then during the flood of 1993, zebra mussel numbers exploded, especially on the lower river where mean densities were as high as 61,000/m^2 and probably resulted from a single settlement event. In general, numbers have declined drastically since then with mortality in excess of 99%, possibly because of water quality marginal for zebra mussels. Even so, during 1994 and 1995 numbers of veligers in the water column have been significant: our sampling indicates over 200 trillion veligers passed our monitoring site in both 1994 and 1995 with calculated loads as high as 60-70 million veligers passing per second. If veliger production follows the same pattern in the future, potential for significant settlement will remain high.

The first report of zebra mussels from the Mississippi River proper was on September 10, 1991, at the Melvin Price Locks and Dam near Alton, Illinois. Another specimen was collected 2 days later near La Crosse, Wisconsin, almost 500 miles and 17 dams upriver. The population explosion has been more modest but widespread on the Upper Mississippi. Densities have been extremely variable among sites and have increased steadily at most locations, with 1995 densities as high as 5,000-10,000/m^2.

Camlin, L. A., J. A. Stoeckel, K. D. Blodgett, and R. E. Sparks. 1996. Seasonal patterns in abundance and size distribution of zebra mussel veligers in the Illinois River: 1994-1995. Poster presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

In river systems, an understanding of dispersal patterns of zebra mussel (*Dreissena polymorpha*) veligers can aid in the development of effective management strategies for adult zebra mussel populations. The main objective of this study was to determine veliger abundance and size distribution fluctuations throughout the year. This information will help us gain insight into locations of upriver source populations and potential downriver settlement patterns. From May 1994 through December 1995, zebra mussel veliger drift was monitored twice weekly at a single site on the Illinois River at Havana, Illinois (river mile 121.1). Veligers were collected by filtering a known volume of depth-integrated river water through a 60-μm plankton net. Veligers were identified using polarized light microscopy, then enumerated and measured using Optimas imaging and analysis software.

In 1994, live veligers were found in all samples from May to October when water temperatures were greater than 12°C and sporadically from November to December when water temperatures were less than 12 °C. In 1995, veligers were found continuously from May to August (water temp > 12 °C), but sporadically in September and October (water temp > 12 °C). While the duration of spawning seasons differed, total veliger production was similar with an estimated 2.0 x 10^{14} and 2.4 x 10^{14} veligers drifting past our site in 1994 and 1995, respectively. Size distributions of veligers were also very similar, the average-sized veliger being 109.7 μm in 1994 and 109.0 μm in 1995. For both years, approximately 80% of veligers were between 95 and 135 μm. This suggests the majority of veligers we saw throughout our study were coming from the same upstream populations.

Locations of source and destination populations were estimated assuming a development time of 48 hours to reach D-stage at 95 m, growth rates of 6-13 μm/day, a settling size of 180-250 μm, and an average flow rate of 0.5 μm/s. Based on these assumptions, the majority of veligers passing our site were produced upriver of Illinois River mile (IRM) 185.2 and would settle downriver of IRM 37.9. Veliger abundances as high as 70 million/second indicated that the potential for significant settlement downriver from our site was high. While we saw little settlement in the lower Illinois River in 1994, significant settlement occurred in 1995. These populations suffered high mortality and virtually disappeared by fall 1995. If total veliger production follows the same pattern in coming years, potential for recolonization of downriver reaches will be high.

Friesen, B., S. Asp, and L. De Haan. 1996. Inland Waterways Spill Response Mapping Project. Poster presented at the Upper Midwest Geographic Information System Workshop, La Crosse, Wisconsin, November 18-20, 1996.

The purpose of the Inland Waterways Mapping Project is to provide community planners and oil spill responders with spatial and technical information on the resources at risk during a spill. Areas included in this project are the portions of the Upper Mississippi River, Ohio River, and Great Lakes Basin that fall within Environmental Protection Agency (EPA) Region 5. Data are collected through partners such as the Upper Mississippi River Basin Association and the Great Lakes Commission. These data are processed at the Environmental Management Technical Center (EMTC), where they are

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Report to Congress Open Houses held at six locations including the Environmental Management Technical Center

Meetings are scheduled to obtain public comments on the draft Report conclusions and recommendatoins.

Report to Congress Underway

To comply with the Water Resources Development Act of 1986, an evaluation of the EMP must be submitted to Congress prior to the year 2002. The evaluation must address the program's effectiveness, strengths, and weaknesses, and contain recommendations for either continuing or terminating the program. Therefore, the Corps of Engineers, Upper Mississippi River Basin Association, Fish and Wildlife Service, and natural resources agencies from the five states are in the process of developing the Upper Mississippi River System—Environmental Management Program Report to Congress (UMRS-EMP). Other agencies, private organizations, and the general public have provided and will continue to provide input into the report. Among the chapters in the report will be those on the health of the Upper Mississippi River System, the habitat rehabilitation and enhancement projects, the long term resource monitoring program, public perspectives, and possible scenarios for the program's future. The draft report has just been released for review by the public. The completed report will be sent to the Congress this fall. ❖

Openhouse attendees discuss the Habitat Rehabilitation and Enhancement Program with Jeff Jandrin (l) of the Wisconsin Department of Natural Resources. *(EMTC photo by Mark Wenger)*

Norman Hildrum (c), of the Environmental Management Technical Center, pointing out key aspects of the Long Term Resource Monitoring Program with several participants. *(EMTC photo by Mark Wenger)*

Public Meeting Schedule

The public is invited to learn about and provide input into the UMRS-EMP Report to Congress. At each meeting, an overview of the Environmental Management Program and the Report to Congress will be made. Participants will be asked to comment on the conclusions and recommendations included in the draft Report. Input as to the future directions of the program will also be pursued. Comments received during the public review period will be included in the Public Perspectives chapter of the final Report to Congress. The format, contents, and objectives for all five meetings will be the same.

Monday, August 18, 1997, 7 p.m.---Holiday Inn City Centre-Salon A, 500 Hamilton Boulevard, Peoria, Illinois

Tuesday, August 19, 1997, 7 p.m.---Holiday Inn Downtown / Riverfront-Salon D, 200 N. Fourth St., St. Louis, Missouri

Wednesday, August 20, 1997, 7 p.m.---Blackhawk Hotel-Gold East Room, 200 E 3rd St., Davenport, Iowa

Tuesday, August 26, 1997, 7 p.m.---St. James Hotel-Mississippi Room, 406 Main St., Red Wing, Minnesota

Wednesday, August 27, 1997, 7 p.m.---Best Western Midway Hotel-Wisconsin Room, 1835 Rose St., La Crosse, Wisconsin

For technical questions regarding the Report, contact Mr. Jerry Skalak, 309/794-5605. For questions about the meeting, contact Ms. Sue Simmons, 309/794-5573.

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automated using geographic information systems software. Once automated, spatial databases can be displayed as hardcopy maps or interactive coverages. A set of statewide sensitivity maps was produced for each of the six states in EPA Region 5 to provide a spatial overview of resources at risk. Subsequently, a hardcopy atlas was published for the seven-county Minneapolis/St. Paul sub-Area. Atlas maps depict environmentally sensitive areas, hydrology, economically sensitive areas, tribal areas, potential spill sources, and transportation corridors against a backdrop of scanned images from U.S. Geological Survey 7.5- or 30-minute quadrangles. The information in this and future atlases, along with pertinent documents for oil spill preparedness, will be served to partners through the EMTC Home Page via the Internet (http://www.emtc.nbs.gov).

Cronin, F. A., J. K. Tucker, and D. W. Soerge. 1996. Predation on zebra mussels (Dreissena polymorpha) by common carp (Cyprinus carpio). Poster presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

We examined the gut contents from 31 common carp *(Cyprinus carpio)* collected at Mississippi River Mile 217 in late August 1995 for evidence of predation on zebra mussels *(Dreissena polymorpha)*. We found between 1 and 407 zebra mussel beaks in 83.9% of the fish we examined. For all fish examined, common carp contained 118.2 beaks per fish or about 59 zebra mussels per fish. Excluding fish that did not contain one or more beaks, we found 140.9 beaks per fish or about 70 zebra mussels per fish. The survey did not indicate that larger fish consumed more zebra mussels than smaller fish. Estimated valve length for zebra mussels consumed by common carp ranged from 1.48 to 42.52 mm with a mean 11.79 mm (SE = 0.10 mm). Individual variation existed among the 24 fish in mean valve length of zebra mussels consumed. We found that large fish tend to prey on larger zebra mussels than small fish. The general size range of zebra mussels consumed by common carp overlapped the upper portion of the size range of young-of-the-year zebra mussels living at the site and the lower portion of the size range of older zebra mussels living at the site. Other prey items found included fingernail clams (Sphaeriidae), the asiatic clam (*Corbicula fluminea*, Corbiculidae), and *Lampsilis teres* (Unionidae). Notwithstanding the possible impact that the common carp may have on zebra mussel demographics, our study bears directly on the controversy surrounding proposals to import other exotic molluscivorous fishes such as the black carp *(Mylopharyngodon piceus)* to effect long-term control of zebra mussel populations. If predation by the common carp is found to be widespread where zebra mussels are numerous, then there is no reason to import other fishes. Further studies of the common carp in other areas with high zebra mussel densities are critically needed.

Lubinski, K. S. 1996. Management in transition on the Upper Mississippi River. Paper presentation at the Rivertech '96 Conference, Chicago, Illinois, September 23, 1996.

Natural resources management on the Upper Mississippi River (UMR) is in a subtle state of transition. A force behind the transition is the top-down restructuring of Federal and some State natural resources agencies around a framework of ecosystem management. However, grassroots support for the transition is also strong. Both movements are based on the assumption that managers will be better able to maintain or restore the ecological integrity of the river by applying the nontraditional concepts embodied in an ecosystem approach.

Change is being effected through the greater recognition of three realities: ecologically relevant spatial scales need to be addressed to solve problems, ecological conditions are inseparable from economic and social conditions, and no single management agency can do it all. As the transition proceeds, scientists and managers are gradually broadening the spatial, disciplinary, and client limits of their "system of interest."

Cosgriff, R. J., and J. C. Nelson. 1996. Short term effects of the 1993 flood on floodplain forests: Pool 26, Upper Mississippi River. Poster presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

The effects of extreme hydrologic events on biota in large river-floodplain ecosystems is highly theoretical, in part, because these disturbance events are so infrequent. In 1993, flooding on the Mississippi and Illinois Rivers rose to record heights. At the Pool 26 reach, the event was classified as a one-in-500 year flood. This unusual event presented a unique opportunity to examine the effects of extreme flooding on floodplain forests. A forest study was initiated in the summer 1995. Sixty-five sites were randomly sampled and permanently established for future monitoring. A 10-m radius plot was established at each site. Within each plot, we measured the dbh of trees and their combined canopy cover was measured. Within 0.5 m^2 subplots, tree seedlings were identified, counted, and their coverage was determined. Similar measurements were obtained for herbaceous plants. Results indicate that oak-hickory communities dominated by pin oak (*Quercus palustris*) had the highest percent tree mortality while oak-hickory communities dominated by bur oak (*Quercus macrocarpa*) and overcup oak (*Quercus lyrata*) showed low percent mortality. Shellbark and shagbark hickory species (*Carya laciniosa* and *Carya ovata*, respectively) showed high percent mortality on all sites. The maple-ash-elm forest

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type showed substantially lower tree mortality rates. Regeneration by oak and hickory seedlings was low on most sites while silver maple (*Acer saccharinum*) regeneration was high. On sites that showed increased tree mortality, seedling regeneration decreased while herbaceous vegetation increased. Herbaceous regeneration coincided strongly with forest mortality and the opening of the overstory canopy. The dominant herbaceous plants were tickseed sunflower (*Bidens aritosa*), great ragweed (*Ambrosia trifida*), and wild millet (*Echinochloa muricata*). The high mortality of pin oak and hickory and their low seedling regeneration raises questions about the future status of many oak-hickory floodplain forests. Their value as timber and wildlife forage make them important species to forest managers. If these communities have problems re-establishing, management practices such as planting may be necessary in order to ensure their future on the floodplain.

Hildrum, N. W., and L. E. Leake. 1996. A data clearinghouse for the Upper Mississippi River System: Providing public access to ecological information. Paper presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

We are drowning in information, but starved for knowledge. - John Naisbitt

Established in 1986 as a multipurpose science center, the Environmental Management Technical Center (EMTC), in Onalaska, Wisconsin, manages the largest river-related inventory, monitoring, research, spatial analysis, and information sharing program in the United States. A major activity at the Center is the multiagency Federal-State Long Term Resource Monitoring Program (LTRMP). Physical and biological data collected through the LTRMP are being used to help assess the potential effects of natural and human-induced activities on the 1,300-mile Upper Mississippi River System (UMRS) ecosystem. In addition, EMTC staff members are actively involved in other research and technical efforts relating to navigation, biodiversity, and resource management.

Field data collection efforts underway

Wisconsin Department of Natural Resources field station staff collecting aquatic vegetation during routine sampling for the Long Term Resource Monitoring Program *(EMTC Photo by Cheri Staege).*

One legislative mandate of the LTRMP is to ensure that high quality data and information about the river system are readily accessible to resource managers and decision makers. The EMTC established a World Wide Web site in July 1994 *(http//www.emtc.nbs.gov)* and provides free access to data and information about the UMRS and related areas in seven adjoining midwestern states. By January 1996, this web site had been visited by individuals from all 50 states and 53 foreign countries. Over 100,000 "hits" were recorded from August to December 1995. The EMTC web site offers information on fish, vegetation, macroinvertebrates, water quality, water levels, aerial photography, satellite imagery, scientific publications, and geographic information system data. Because the UMRS has regional, national, and international significance, the EMTC web site has become a key node in the effort to establish a National Biological Information Infrastructure. This paper discusses the development of the data clearinghouse and illustrates how the public may access ecological data and information.

Irons, K. S., P. T. Raibley, T. M. O'Hara, K. D. Blodgett, and R. E. Sparks. 1996. Flood pulse effects on recruitment and growth of selected fish species in La Grange Reach of the Illinois River. Paper presented at the 34th Annual Meeting of the Illinois Chapter and the 28th Annual Meeting of the Indiana Chapter, American Fisheries Society, Chicago, Illinois, March 5-7, 1996.

The flood pulse concept suggests faunas of large river floodplain ecosystems have adapted to utilize increased productivity and access to additional habitats when the floodplain is inundated during floods. Many riverine fish species here in the Midwest may benefit from protracted spring floods that provide additional habitat for spawning and nursery areas as well as increased quantity and quality of food. To test this hypothesis, we compared year-class strength and growth of four Illinois River fish species from years with relatively small (duration and height) spring floods (1991,

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1992, 1994) to those with more significant floods (1993 and 1995). Length-frequency distributions for largemouth bass, bluegill, black crappie, and white bass collected during the flood years of 1993 and 1995 showed an increased abundance of age-0 fish compared to years with smaller floods. We used scales and otoliths to determine growth rates and found most ages of largemouth bass and bluegill grew faster during years with higher, more protracted floods. However, no significant differences in growth were observed for black crappie or white bass. All four species have shown recruitment into the breeding population from the 1993 year class.

During this century, physical alterations in the basin such as leveeing of the floodplain and channelization of tributary streams have contributed to "spiky," multiple-peak spring floods rather than smooth floods of long duration. These spiky floods, with their quick rises and falls, can strand and contribute to the mortality of both juvenile and adult fishes trying to take advantage of the flood pulse. Management techniques that contribute to restoring a smoother hydrograph with a protracted spring flood should facilitate increased growth and recruitment of many species of riverine fishes adapted to exploit the spring flood.

Delaney, R. L. 1996. Forecasting the future given current management practices and use. Paper presented at the 28th Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

The Mississippi River is by far the largest riverine ecosystem in North America; the river floodplain and deltaic plain total nearly 12 million hectares (30 million acres). Draining 41% of the contiguous United States, the river is one of the most significant environmental factors influencing the Gulf of Mexico. Valued as a natural, historical, cultural, commercial, recreational, and transportation resource, the Mississippi River has been a major influence on the development and settlement of the United States.

Over the past 200 years, the Mississippi River and its floodplain have been—and continue to be—seriously degraded by massive water pollution, wetland drainage, deforestation, habitat destruction, water-flow modification, and floodplain development. Two of the most deleterious river modifications have been (1) the 90% reduction in the amount of seasonally inundated floodplain because of levee construction and (2) the alignment and maintenance of the navigation channel, which traverses 85% of the river's length. Altered hydrology and sedimentation patterns have progressed to the point that geomorphic processes have been severely disrupted.

Continued fragmentation of management responsibilities among and within government agencies hinders scientifically sound management of the river and floodplain. Given current management practices, policies, and use, the ecological condition of the river and its floodplain is expected to worsen.

Lowenberg, C., T. Owens, L. Arndt, D. Bergstedt, S. Hagendorn, and L. Leake. 1996. Distribution of the Long Term Resource Monitoring Program data on compact disk. Poster presented at the 28thAnnual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 25-26, 1996.

The Long Term Resource Monitoring Program (LTRMP) is the largest river-related inventory, monitoring, research, spatial analysis, and information sharing program in the United States. The mission of the LTRMP is to provide decision makers with information to maintain the Upper Mississippi River System (UMRS) as a viable large river ecosystem given its multiple-use character. One way that the program is providing access to its geographic information system (GIS) data is through a compact disk (CD) created for UMRS Pool 8. The CD contains high-resolution scanned and rectified images of UMRS Pool 8 1994 1:15,000 scale color-infrared aerial photography, UMRS Pool 8 PC ARC/INFO-format GIS coverages, LTRMP trend data collected within Pool 8, ArcView 1 data access routines, an ArcView 2 access routine, ArcView 1 data access software, and data documentation. The development of additional CDs will be dependent upon additional funding. ❖

St. Louis District given award from page 1

of the additional plant growth, but because navigation traffic was unaffected. This was made possible because the District's Water Control Section frequently checked hydraulic conditions, assuring that the nine-foot channel was always maintained.

The Environmental Management Technical Center assisted in the project by estimating plant response using aerial photography. Center staff found that between 255 and 880 acres of plants were measured near the water line in Pools 24 through 26 for the six miles upstream of each dam. This compared to just 51 acres in Pool 22 which was not managed for plant growth. Additional information concerning the experiment can be found in the April 1995 issue of the River Almanac. ❖

Did you know?

The Long Term Resource Monitoring Program (LTRMP) is the largest river-related inventory, monitoring, research, spatial analysis, and information sharing program in the United States.

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Wlosinski, J. H., and E. R. Koljord. 1996. ***Effects of water levels on ecosystems: An annotated bibliography.*** U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1996. LTRMP 96-T007. 261 pp.

Wlosinski, J. H., and J. Rogala. 1996. ***Pool 25: Water level management alternatives and their effects on habitat.*** National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. LTRMP 96-T004. 85 pp. + Appendixes A–D.

Project Status Reports

Wlosinski, J. H., and J. T. Rogala. 1996. ***Predicting the effects of water level management options.*** USGS, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. Project Status Report 96-03. 2 pp.

Wlosinski, J. H., and S. R. Marecek. 1996. ***Fish movement on the Upper Mississippi River.*** USGS, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. Project Status Report 96-04. 2 pp.

Yin, Y. 1997. ***Estimating inundation-induced tree mortality using river water level data.*** USGS, Environmental anagement Technical Center, Onalaska, Wisconsin, February 1997. Project Status Report 97-01. 2 pp.

Delaney, R.L., and M.R. Craig. 1997. ***Longitudinal changes in Mississippi River Floodplain structure.*** USGS, Environmental anagement Technical Center, Onalaska, Wisconsin, February 1997. Project Status Report 97-01. 2 pp.

Raibley, R.T., and R.E. Sparks. 1997. ***River levels and largemouth bass populations in the Illinois River.*** USGS, Environmental Management Technical Center, Onalaska, Wisconsin, May 1997. Project Status Report 97-03. 2 pp.

Wlosinski, J.H., J.T. Rogala, and K.J. Landwehr. 1997. ***Predicting areas dewatered and the likelihood of success of a water-level drawdown in Pool 13.*** USGS, Environmental Management Technical Center, Onalaska, Wisconsin, May 1997. Project Status Report 97-04. 2 pp.

Gowda, P.H. 1997. ***Evaluation of the hydice sensor for mapping floodplain vegetation in navigation pool 13, Upper Mississippi River System.*** USGS, Environmental Management Technical Center, Onalaska, Wisconsin, May 1997. Project Status Report 97-05. 2 pp.

Nelson, J.C., L. Robinson, L. DeHaan, and M. Bower. 1997. ***Using historical data to evaluate the ecological integrity of the Upper Mississippi River System.*** USGS, Environmental Management Technical Center, Onalaska, Wisconsin, June 1997. Project Status Report 97-06. 2 pp.

Wlosinski, J.H., et al. 1997. ***Vegetation response to a water level experiment.*** USGS, Environmental Management Technical Center, Onalaska, Wisconsin, July 1997. Project Status Report 97-07. 2 pp. ❖

USGS asks for public's help with deformed frog research

U.S. and Canadian residents are being asked to help in the scientific investigation of deformed frogs, toads, and salamanders. Citizens are encouraged to report sightings of both normal and malformed amphibians that are encountered during hiking, fishing, or other outdoor related activities.

"We need rigorous scientific investigations as well as observations from the general public to understand the observed decline in North American amphibian populations and the increase in reports of deformed amphibians," said Denny Fenn, Chief, Biological Resources Division of the U.S. Geological Survey.

The North American Reporting Center for Amphibian Malformations (NARCAM) is an Internet Website maintained by the USGS Northern Prairie Science Center in Jamestown, N.D. NARCAM provides information on the geographic distribution of amphibians and makes that information readily available to scientists who are investigating the problem.

Scientific concern began in 1995 when middle school students on a field trip reported a high incidence of leopard frogs with misshapen, extra, or malformed limbs in a farm pond in southern Minnesota. Since then, these and other malformations, including missing and misplaced eyes, have been reported among many amphibian species in several states and provinces across the continent.

Efforts to determine the cause or causes of the problem are driven by concern both for amphibian populations and for human health. Like the canaries that miners once carried to detect poison gases, amphibians may deserve attention because they are especially sensitive to chemical contaminants and other stressors in aquatic environments.

The Website (http://www.npsc.nbs.gov/narcam), which is jointly funded by the USGS and the U.S. Environmental Protection Agency, provides background information on the problem in common-language terms, maps of known incidences, photographs of malformed frogs, and sources of additional information.

The site also has an easy to use data-entry form through which anyone can report an observed malformation. The report form can also be used to record the absence of malformations in a location if the observer has examined several animals.

Want more information? The USGS technical contact is Dave Fellows at (701) 252-5363, x5514 ❖

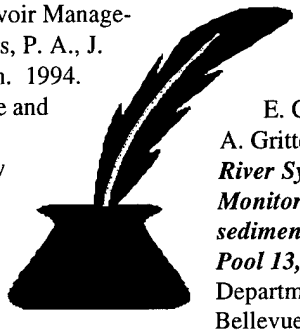
Richard Hoop's River of Grain report available

The University of Wisconsin's Department of Agricultural Journalism has made available to the EMTC 140 copies of Richard Hoops's "River of Grain: the Evolution of Commercial Navigation on the Upper Mississippi River". Upon request and while supplies last, EMTC will distribute copies at no cost. Please send requests to Mark Wenger, U.S. Geological Survey, Environmental Management Technical Center, 575 Lester Avenue, Onalaska, WI 54650.❖

New Reports

The following reports were recently completed and have been distributed to Program partners. LTRMP reports are available through the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161 (800/ 553-6847 or 703/487-4650).

Barko, J. W., P. A., Chambers, and C. S. Smith. 1994. ***Perspectives on submersed macrophyte invasions and declines.*** Lake and Reservoir Management 10(1):1-3. Chambers, P. A., J. W. Barko, and C. S. Smith. 1994. Workshop synthesis. Lake and Reservoir Management 10(1):57-59. Reprinted by the U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, November 1996. LTRMP 96-R010. 7 pp.



Bartels, A. D. 1995. ***Growth of selected fishes in Navigation Pool 8 of the Upper Mississippi River: A test of the flood-pulse concept.*** M.S. thesis submitted to the faculty of the graduate school of the University of Wisconsin-La Crosse, December 1995. Reprinted by U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, January 1997. LTRMP-97-R001. 63 pp.

Bellrichard, S. J. 1994. ***Effects of common carp (Cyprinus carpio) on submerged macrophytes and water quality in a backwater lake on the Upper Mississippi River.*** M.S. thesis submitted to the faculty of the graduate school of the University of Wisconsin-La Crosse. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1996. LTRMP 96-R008. 44 pp.

Bhowmik, N. G., B. S. Mazumder, R. Xia, and T. W. Soong. 1995. ***Distribution of turbulent velocity fluctuations in a natural river.*** Journal of Hydraulic Research 33(5):649-661. Reprinted by U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1996. LTRMP 96-R012. 13 pp.

Gent, R. D., M. J. Steuck, D. E. Gould, M. K. Griffin, and S. A. Gritters. 1996. ***Upper Mississippi River System Long Term Resource Monitoring Program water and sediment component annual report, Pool 13, 1989.*** Report by the Iowa Department of Natural Resources, Bellevue, Iowa, for the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, September 1996. LTRMP 96-S002. 46 pp.

McConville, D. R., T. W. Owens, and A. S. Redmond. 1996. ***Geospatial application: A geographic information system interface designed for use in river management.*** National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, July 1996. LTRMP 96-T003. 21 pp. + Appendixes A-B.

Olsen, D. A., and T. Owens. 1996. ***Training manual, Introduction to GIS: Using ARC/INFO on a UNIX platform.*** U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, Revised October 1996. LTRMP 96-P003. 82 pp. + Appendixes A-B.

Owens, T., and L. Robinson. 1996. ***Long Term Resource Monitoring Program standard operating procedures: Manual zoom transfer scope.*** U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1996. LTRMP 95-P008-5. 3 pp. + Appendix.

Rogala, J. T. 1996. ***Surficial sediment characteristics in Pools 4 and 8, Upper Mississippi River.*** U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, November 1996. LTRMP 96-T006. 22 pp.

Rogala, J. T., and P. J. Boma. 1996. ***Rates of sedimentation along selected backwater transects in Pools 4, 8, and 13 of the Upper Mississippi River.*** U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. LTRMP 96-T005. 24 pp.

Tucker, J. K. 1996. ***Herpetological investigations in Illinois.*** Reprinted by U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, December 1996. LTRMP 96-R011. 20 pp.

Tucker, J. K., D. W. Soergel, and J. B. Hatcher. 1995. ***Flood-associated activities of some reptiles and amphibians at Carlyle Lake, Fayette County, Illinois.*** Transactions of the Illinois State Academy of Science 88(1/2):73-81. Reprinted by the National Biological Service, Environmental Management Technical Center, Onalaska, Wisconsin, August 1996. LTRMP 96-R009. 9 pp.

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Environmental Management Technical Center
U.S. Geological Survey
575 Lester Avenue
Onalaska, WI 54650-8552

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